

JPL-teamed Discovery proposals selected for study

If approved, missions would probe Jupiter's interior, smash projectile into comet

JPL proposals to analyze Jupiter's interior through measurements of the planet's gravitational and magnetic fields—and to fire a copper projectile into a comet to study its ice and rock—have been selected among five proposals to go forward for detailed study as candidates for the next missions in NASA's Discovery Program of lower-cost, highly focused scientific spacecraft.

The proposed Jupiter orbiter, known as Interior Structure and Internal Dynamical Evolution of Jupiter, or Inside Jupiter, would fly to within approximately 1,000 kilometers (600 miles) of the surface of the planet.

Deep Impact would be a flyby mission designed to fire an 1,100-pound (500 kilogram) copper projectile into the comet P/Tempel 1, excavating a large crater more than 65 feet (20 meters) deep, in order to expose its pristine interior ice and rock.

JPL's Dr. Edward Smith, who also serves as NASA project scientist for the Ulysses mission to the Sun, would be principal investigator for Inside Jupiter. Smith said the proposed mission would launch aboard a Delta II rocket in February 2004, fly by Earth in January 2006 and arrive at Jupiter in April 2008. The mission would conclude in August 2009.

Total cost of the proposed mission is \$227.3 million. The spacecraft would be designed and built by Ball Aerospace & Technologies Corp. of Boulder, Colo.

"The spacecraft's trajectory would bring it to an orbit around Jupiter in a very high inclination," Smith said, "and part of the orbit would bring the spacecraft very close to the surface of Jupiter—to within about 1,000 kilometers of the visible atmosphere."

"We wouldn't be flying directly over the poles, but would be getting the high latitudes of Jupiter, which makes it ideal for mapping of gravity and magnetic fields," he added.

Additional investigations for the mission would be radio occultation experiments to learn about the structure of Jupiter's atmosphere. An energetic particle spectrometer will assist in studying magnetic fields, "and help us characterize the environment," Smith said.

JPL's Earth and Space Sciences Division generated the proposal. Besides Smith, other JPL personnel involved in the project include Dr. Tom Spilker, proposal manager and co-investigator; Dr. Neil Murphy, co-investigator, energetic particle experiment; Dr. John Anderson, co-investigator, gravitational fields measurement.

Inside Jupiter's science team also includes the following co-investigators: Dr. Andrew Ingersoll, Caltech; Dr. David Hinson, Stanford University; Prof. William Hubbard, University of Arizona; Dr. Barry Mauk, Johns Hopkins University; Prof. David Stevenson, Caltech; and Prof. G. Leonard Tyler, Stanford.

Imaging and atmospheric data gained by the Galileo spacecraft "will be of particular interest to us," Smith said. "Scientifically, we'll do some of the same things as Galileo, and we're depending on key personnel from that mission to help make Inside Jupiter a success. There have been gravity measurements of Jupiter done by Galileo but they never went any closer than about four Jupiter radii (290,000 kilometers or 175,000 miles). We will make all of our measurements probably within two Jupiter radii (about 143,000 kilometers or 89,000 miles), and as close as 1,000 kilometers.

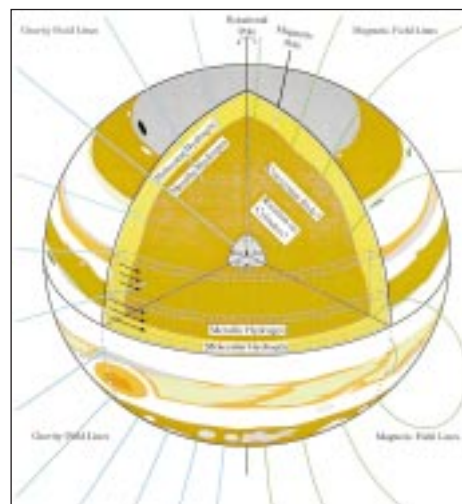
"We will not emphasize the Galilean satellites," Smith noted. "We will be directing all our attention to what's below the spacecraft, and particularly when we're close to Jupiter."

The Deep Impact mission proposal manager is Dr. Cliff Anderson of JPL. The project's principal investigator is Dr. Michael A'Hearn of the Department of Astronomy, University of Maryland, College Park. Total cost is to be \$203.8 million.

Proposed for launch in January 2004, an Earth gravity-assist flyby in January 2005 and arrival at P/Tempel 1 in July 2005, the Deep Impact spacecraft would precede by about five months the arrival of JPL's proposed Deep Space 4 Champollion project, which would land on the comet.

The project would be the first investigation to determine P/Tempel 1's ice depth and the structure of the outer layers of its nucleus, and "would study the relationship between the measurements made by the lander mission and the pristine material that we seek in comets," Anderson added.

Measurements made from the spacecraft would include:



Inside Jupiter would measure the planet's gravitational and magnetic fields and use the information to infer the structure and dynamics of its interior.

- Broadband images of the surface made from a camera on the impactor as it approaches, with ever-increasing spatial resolution; ultimately, images of the impact site would be acquired with a resolution of less than a meter;

- White-light and medium-band images of the crater excavation process and of the resultant crater;

- Near-infrared spectral images of the outflowing hot debris, surface of the nucleus and crater and outgassing to the coma before, during and after the event.

Anderson said two imagers onboard the spacecraft would "make events readily observable from Earth, and an intensive campaign of observations at nearly all wavelengths from both ground-based and Earth-orbital facilities is planned."

"The Deep Impact proposal got approved for the second step in the Discovery process on the basis of the outstanding science return expected and an exceptional team of scientists," Anderson said.

Two JPL scientists are named for the science team. Kenneth Klaasen of Section 385 is the interface to the mission operations system and will coordinate all aspects of scientific mission planning and flight operations, and Dr. Donald Yeomans, manager of the Near-Earth

Special Events Calendar

Ongoing

Alcoholics Anonymous—Meeting at 11:30 a.m. Mondays, Tuesdays, Thursdays (women only) and Fridays. For more information, call Occupational Health Services at ext. 4-3319.

Codependents Anonymous—Meeting at noon every Wednesday. Call Occupational Health Services at ext. 4-3319.

Gay, Lesbian and Bisexual Support Group—Meets the first and third Fridays of the month at noon in Building 111-117. Call employee assistance counselor Cynthia Cooper at ext. 4-3680 or Randy Herrera at ext. 3-0664.

Parent Support Group—Meets the fourth Tuesday of the month at noon. For location, call Jayne Dutra at ext. 4-6400.

Senior Caregivers Support Group—Meets the second and fourth Wednesdays of the month at 6:30 p.m. at the Senior Care Network, 837 S. Fair Oaks Ave., Pasadena, conference room #1. For more information, call (626) 397-3110.

Wednesday, November 25

JPL Drama Club—Meeting at noon in Building 301-127.

JPL Toastmasters Club—Meeting at 5:30 p.m. in the Building 167 conference room. Guests welcome. Call Mary Sue O'Brien at ext. 4-5090.

Russian Language Workshop—Meets from 7 to 9 p.m. on the Caltech campus. Some knowledge or previous study of the language is essential. Call Joyce Wolf at ext. 4-7361.

Tuesday, December 1

JPL Gamers Club—Meeting at noon in Building 301-227.

JPL Genealogy Club—Meeting at noon in Building 301-169.

Wednesday, December 2

Associated Retirees of JPL/Caltech—Meeting at 10 a.m. at the Caltech Credit Union, 528 Foothill Blvd., La Cañada.

JPL Drama Club—Meeting at noon in Building 301-127.

Russian Language Workshop—Meets from 7 to 9 p.m. on the Caltech campus. Some knowledge or previous study of the language is essential. For location and further information, call Joyce Wolf at ext. 4-7361.

Thursday, December 3

JPL Gun Club—Meeting at noon in Building 183-328.

Friday, December 4

Caltech Women's Club Holiday Party—To be held at the Athenaeum, reception starts at 6 p.m., with dinner at 7 p.m. Dancing until midnight. Tickets: \$30 for Caltech Women's Club members and significant others, \$32 for non-members. Phone reservations to Vilja Zmuidzinas at (626) 395-3343. Deadline is Nov. 27.

JPL Dance Club—Meeting at noon in Building 300-217.

"Lost Worlds of the Bible"—This travel film covers historical sites contemporary to biblical references in Lebanon, Israel, Syria and Jordan. To be held at 8 p.m. in Caltech's Beckman Auditorium. Tickets are \$9 and \$7. For information, call (626) 395-4652.

NASA Commercialization Center—Julie Holland, director of the center at Cal Poly Pomona, will present information and answer questions at noon in Building 180-801. Call Dr. Tom Lloyd at ext. 4-3821.

Fri., Dec. 4–Sat., Dec. 5

Holiday Concert—Songs of the season will be performed by women's, men's and mixed voices, along with harp and brass, during this free concert at 8 p.m. in Caltech's Dabney Lounge. For more information, call (626) 395-4652.

Saturday, December 5

ERC Holiday Party—Entertainment from Jim Gamble's marionettes in "T'was the Night Before Christmas," gifts and visits from Santa and Mrs. Claus highlight

the event, to be held at Lanterman Auditorium in La Cañada from 10 to 11:30 a.m. Tickets are available at the ERC for \$3 per person.

Sunday, December 6

Chamber Music—The Takács Quartet will perform Haydn, Bartók and Dvorak in this 3:30 p.m. concert in Caltech's Beckman Auditorium. Tickets are \$25, \$21, \$17 and \$13. For information, call (626) 395-4652.

Tuesday, December 8

JPL Scuba Club—Meeting at noon in Building 168-427.

JPL Stamp Club—Meeting at noon in Building 183-328.

TDA Open House—Tax-deferred annuity representatives from Fidelity, Prudential and TIAA/CREF will be available from 9 a.m. to noon and 1 to 3 p.m. in Building 291-202 to answer questions regarding 403-B pre-tax deferred annuity plans.

Wednesday, December 9

JPL Amateur Radio Club—Meeting at noon in Building 238-543.

JPL Drama Club—Meeting at noon in Building 301-127.

JPL Toastmasters Club—Meeting at 5:30 p.m. in the Building 167 conference room. Guests welcome. Call Mary Sue O'Brien at ext. 4-5090.

Russian Language Workshop—Meets from 7 to 9 p.m. on the Caltech campus. Some knowledge or previous study of the language is essential. For location and further information, call Joyce Wolf at ext. 4-7361.

SESPD Lecture Series—Dr. Les Deutsch of the Advanced Flight Systems Program Office will discuss the Deep Space Systems Technology Program at 11 a.m. in von Kármán Auditorium.

Thursday, December 10

JPL Astronomy Club—Meeting at noon in Building 198-102.

Friday, December 11

JPL Dance Club—Meeting at noon in Building 300-217.

Tuesday, December 15

Investment Advice—Fidelity Investments representative. Alyssa Valladao will be available for individual appointments. To make an appointment, call Patrice Houle-mard at ext. 4-2549.

Wednesday, December 16

JPL Drama Club—Meeting at noon in Building 301-127.

JPL Hiking Club—Meeting at noon in Building 238-543.

Russian Language Workshop—Meets from 7 to 9 p.m. on the Caltech campus. Some knowledge or previous study of the language is essential. Call Joyce Wolf at ext. 4-7361.

Thursday, December 17

JPL Atari Club—Meeting at noon in Building 238-544.

Von Kármán Lecture Series—Galileo Project Manager Jim Erickson will speak at 7 p.m. in von Kármán Auditorium. Open to the public.

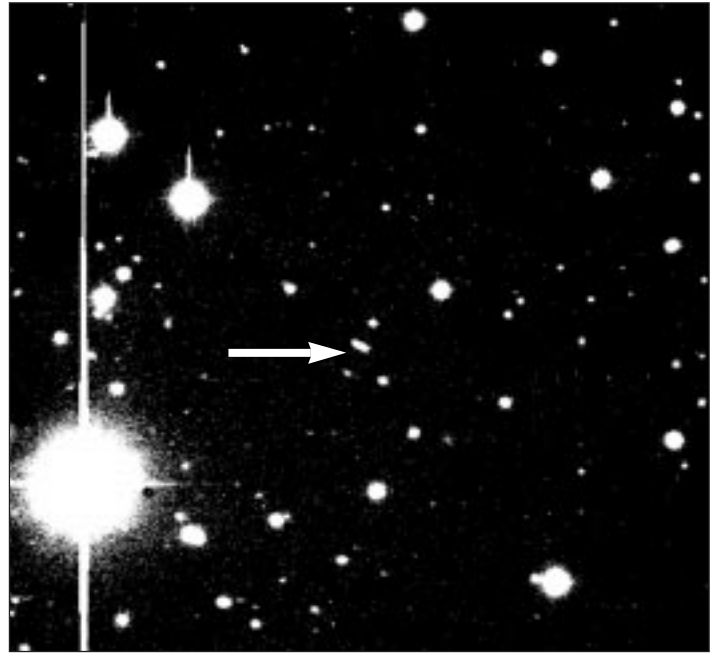
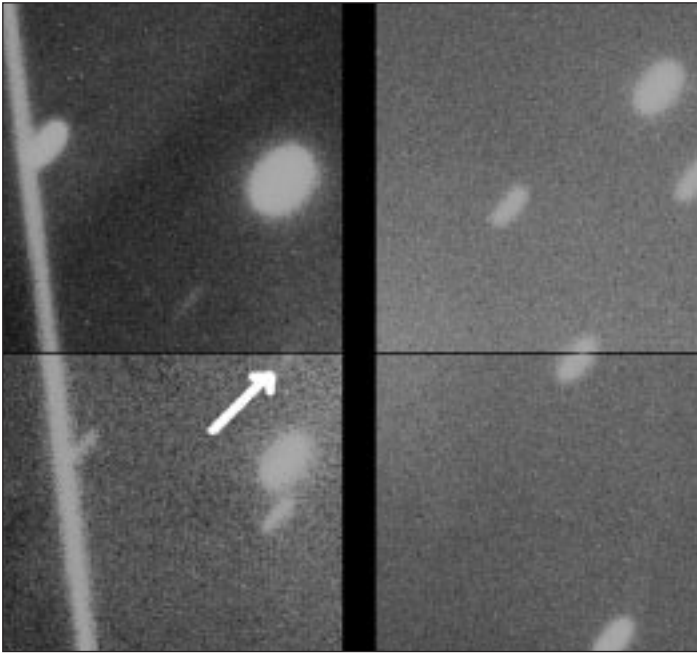
Friday, December 18

JPL Dance Club—Meeting at noon in Building 300-217.

Von Kármán Lecture Series—Galileo Project Manager Jim Erickson will speak at 7 p.m. in The Forum at Pasadena City College, 1570 E. Colorado Blvd. Open to the public.

Award For Excellence Nominations—Due today from JPL personnel in technical organizations (3X, 4X, 5X, 7X, 8X, and 9X) to the Reward & Recognition Administrator. For more information, visit the R&R home page at <http://eis/sec614/reward/excel.htm> or call the R&R program office at ext. 4-3825. Note: Nominations will be accepted from business/administrative organizations (1X, 19X, 2X, and 6X) Jan. 4–22, 1999.

Telescope captures DSI's target asteroid, spacecraft in flight



JPL astronomers Stuart Shaklan and Dr. Steve Pravdo on Oct. 2 used the Stellar Planet Survey instrument on the 5-meter (200-inch) Palomar telescope to make astrometric observations of 1992 KD, left, Deep Space 1's scheduled flyby target on July 28, 1999. The image shows 1992 KD surrounded by elongated stars, elongated because astronomers were tracking on the motion of the asteroid. David Rabinowitz and Andrea Boattini reduced the astrometric data consisting of three images. At right, Deep Space 1 as captured by JPL astronomers Drs. Bonnie Buratti, Paul Weissman, Michael Hicks and Alain Doressoundiram using the same telescope on Nov. 16, when the spacecraft was 3.7 million kilometers (2.3 million miles) from Earth. Jon Giorgini assisted with telescope-pointing predictions using JPL's Horizons online ephemeris system, an Internet-accessible computer program Giorgini developed that computes positions of objects in the solar system as seen from any location on Earth. These predictions were based on orbit determination performed by the Deep Space 1 navigation team.

Voyager 2 OK after blackout

The Voyager 2 spacecraft, now on the outer fringes of the solar system, was returned to normal flight operations Saturday, Nov. 14, after a 66-hour communications blackout which began on Thursday, Nov. 12.

Ground controllers at the Deep Space Network station near Madrid, Spain, lost Voyager 2's signal on Wednesday night at about 11:57 p.m. Pacific Standard Time. At the time, the spacecraft was in the process of shutting down power to its scan platform which contains science instruments, including the ultraviolet spectrometer. Preliminary analysis indicated that the commands were properly sent to the spacecraft.

Turning off the scan platform is part of a power conservation plan to keep Voyager 2 operating until at least the year 2020. There are still five experiments operating on Voyager 2: the cosmic ray instrument, low-energy charged particle instrument, plasma science instrument, plasma wave instrument and the magnetometer.

As the spacecraft's onboard plutonium power source decays, it is necessary to periodically reduce the spacecraft electrical power usage in order to maintain an adequate power margin.

About 720 commands were sent Nov. 12 to turn on the spacecraft's X-band transmitter; however, communication with the spacecraft was not immediately reestablished. Subsequent analysis of the probable failure modes suggested the spacecraft's onboard S-band exciter, a small oscillator used to generate the spacecraft's carrier frequencies, could have been shut off. About 360 commands were sent the evening of Nov. 13 to turn the spacecraft's S-band exciter back on.

The flight team reacquired the spacecraft's signal the evening of Nov. 14 at approximately 6:18 p.m. Pacific Standard Time. Telemetry had been switched to a data rate of 40 bits per second from the standard operating rate of 160 bits per second. Spacecraft systems were functioning normally, although some hardware components were slightly warmer than expected. The flight team reported that the backup X-band transmitter was on at the time of signal reacquisition.

Subsequent analysis of the spacecraft computer memory showed that the scan platform power-down sequence had executed exactly as planned. The team will continue to analyze data to determine the cause of signal loss.

Voyager 2 is departing the solar system at 48 degrees to the south of the ecliptic plane at a speed of 15.9 kilometers per second (35,000 mph). Round-trip light time from Earth to Voyager 2 is currently about 16 hours. The spacecraft is now 8.4 billion kilometers (5.2

See Voyager, page 6

La Niña, El Niño coexist in Pacific, TOPEX shows

By MARY HARDIN

The latest measurements of sea surface height made by JPL's TOPEX/Poseidon satellite show the tropical Pacific Ocean with a stalled La Niña condition coexisting with the remnants of last year's El Niño event.

"The forecasted intensification of this La Niña for fall 1998 and into winter 1999 has yet to live up to its billing," said Dr. Bill Patzert, a research oceanographer at JPL. "The size and heat content of this cold pool of water has remained remarkably stable for the past five months since El Niño began to dissipate in mid-June."

The image shows sea-surface height on Nov. 8, 1998, relative to normal ocean conditions. Sea surface height is an indicator of the heat content of the ocean. Remnants of the high sea level, warmer El Niño waters still linger to the north of the equator—while the area of low sea level, or cold water that is sometimes referred to as La Niña, remains in the center of the Pacific. Oceanographers believe that the

See TOPEX, page 6

Discovery

Continued from page 1

Objects Project Office, will be responsible for optimizing the ephemeris of P/Tempel 1 and developing the targeting strategy for both the impactor and the spacecraft.

Other team members are Dr. Michael Belton, National Optical Astronomy Observatories; Alan Delamere, Ball Aerospace & Technologies; Jochen Kissel, Max Planck Institute; Lucy McFadden, University of Maryland; Karen Meech, University of Hawaii; H. Jay Melosh, University of Arizona; Peter Schultz, Brown University; Jessica Sunshine, Science Applications International Corporation; and Joseph Veverka, Cornell University.

In addition to Inside Jupiter and Deep Impact, the mission proposals selected by NASA for further study would send spacecraft to orbit Mercury, return samples of the two small moons of Mars to Earth and investigate the middle atmosphere of Venus.

The five missions were among 26 proposals submitted to NASA. "The degree of innovation in these proposals climbs higher each time we solicit ideas," said Dr. Ed Weiler, associate administrator for space science at NASA Headquarters. "Deciding which one or two of these exciting finalists will be fully developed will be a very difficult choice—any one of them promises to return unique insights into our solar system. Meanwhile, the solar wind instrument will fill in some critical gaps in our understanding of the history of water on Mars."

Following detailed mission concept studies, which are due for submission by March 31, 1999, NASA intends to select one or two of the mission proposals in June 1999 for full development as the seventh and possibly eighth Discovery Program flights.

The selected proposals were judged to have the best science value among 30 total proposals submitted to NASA in response to an Announcement of Opportunity issued last March. Each will now receive \$375,000 to conduct a four-month implementation feasibility study focused on cost, management and technical plans, including small business involvement and educational outreach. Initial mission cost estimates will not be allowed to grow by more than 20 percent in the detailed final proposals.

The other selected Discovery proposals are:

- Aladdin, a mission to gather samples of the Martian moons Phobos and Deimos by firing projectiles into the moons' surface and gathering the ejecta during slow flybys. It would then return the samples to Earth for detailed study. Aladdin would be led by Dr. Carle Pieters of Brown University in Providence, R.I. Co-investigators include JPL's Dr. Donald Yeomans and Dr. Charles Yoder.
- The Mercury Surface, Space Environment, Geochemistry and Ranging mission, or Messenger, an orbiter spacecraft carrying seven instruments to globally image and study the closest planet to the Sun. Messenger would be led by Dr. Sean Solomon of the Carnegie Institution, Washington, D.C.
- The Venus Sounder for Planetary Exploration, or Vesper, an orbiter with four instruments to measure the composition and dynamic circulation of the middle atmosphere of Venus and its similarities to processes in Earth's atmosphere. Vesper would be led by Dr. Gordon Chin of NASA's Goddard Space Flight Center, Greenbelt, Md. JPL co-investigators are Drs. Mark Allen, David Crisp and Victoria Meadows.

In a unique step for the Discovery Program, NASA has also decided to fund a co-investigator to provide part of an instrument to study the interaction between the solar wind and the atmosphere of Mars. It is scheduled to fly aboard the European Space Agency's Mars Express spacecraft in 2003. NASA plans to consider such investigations, categorized as "Missions of Opportunity," in all future Discovery and Explorer program Announcements of Opportunity.

The solar wind science hardware to be built as part of the selected Mission of Opportunity is intended for an instrument called the Analyzer of Space Plasmas and Energetic Atoms, or ASPERA-3. The principal investigator for this instrument is Dr. R. Lundin of the Swedish Institute of Space Physics. The co-investigator being funded by NASA is Dr. David Winningham of the Southwest Research Institute, San Antonio, Texas.

The investigations proposed in response to this AO were required to address the goals and objectives of the Office of Space Science's Solar System Exploration theme, or the search for extrasolar planetary systems element of the Astronomical Search for Origins theme. The missions

must be ready for launch no later than Sept. 30, 2004, within the Discovery Program's development cost cap of \$190 million in Fiscal 1999 dollars over 36 months, and a total mission cost of \$299 million.

The next launch of a Discovery mission is scheduled for Feb. 6, 1999, when the Stardust mission will be sent on its way to gather a sample of comet dust and return it to Earth in January 2006. The first Discovery mission, the Near Earth Asteroid Rendezvous (NEAR) spacecraft, is due to arrive at its target asteroid, 433 Eros, on Jan. 10, 1999, for at least a year of close-up observations from an orbit around the Manhattan-sized body. □

Weiler replaces Huntress at HQ

NASA Administrator Daniel Goldin has named Dr. Edward Weiler as associate administrator for NASA's Office of Space Science.

Weiler has served as acting associate administrator since Sept. 28, following the departure of Dr. Wesley Huntress Jr.

"In his short time as acting associate administrator, Ed Weiler has demonstrated both the management skills and scientific leadership that this position demands, and I am delighted he has accepted the offer on a more permanent basis," Goldin said.

In this capacity, Weiler will be responsible for providing overall executive leadership of NASA's Space Science Enterprise.

This enterprise aims to achieve a comprehensive understanding of the origins and evolution of the solar system and the universe, including connections between the

Sun and the Earth, the beginnings of life and the question of whether life exists elsewhere beyond Earth. It also is charged with communicating this knowledge to the public.

Weiler was appointed as science director of the Astronomical Search for Origins and Planetary Systems theme within the Office of Space Science in March 1996. He will continue to serve as the program scientist for the Hubble Space Telescope, a position he has held since 1979, until a replacement for that position is selected.

Weiler joined NASA in 1978 as a staff scientist. Prior to that, Weiler was a member of the Princeton University research staff and was based at NASA's Goddard Space Flight Center, Greenbelt, Md., as the director of science operations of the Orbiting Astronomical Observatory-3 (COPERNICUS). □

New Millennium says thanks



PHOTO BY DUTCH SLAGER / JPL PHOTO LAB

On behalf of the New Millennium Program, Deep Space 1 Project Manager David Lehman, left, presents a certificate of appreciation to Dr. John Stubbard of the Ballistic Missile Defense Organization, a member of the Deep Space 1 flight team, for exceptional achievement in overseeing the development and delivery of the Scarlet solar array. This advanced technology will significantly enable future NASA missions' ability to generate scientific knowledge.

Archives, Safety hold open houses

Safety lab part of new Bldg. 200 facility

JPL's Safety Operations Section celebrated the opening of its new facility in Building 200 with a Nov. 5 open house.

Laboratory Director Dr. Edward Stone, Associate Director Kirk Dawson and Business Operations Director Daryal Gant cut a ribbon to dedicate the opening of new offices that will house JPL's first industrial hygiene laboratory, as well as the industrial hygiene and workers' compensation groups.

The new laboratory includes a number of instruments used by the Safety Operations Section in monitoring potential exposures to employees concerning chemical, noise, radiation, air quality and emergency response issues. Section personnel will use the laboratory to analyze sample data.

The facility also includes a "regulatory repository," which contains numerous technical references, including health and safety program documentation, Standard Operating Procedures for JPL employees and California Occupational Safety and Health Administration regulations.

"Senior management has provided Safety Operations Section the facility and tools needed to support all JPL employees in the areas of safety and health, launching the section into the new millennium as a world class health and safety organization," said Pamela Brown, section supervisor. □



Above, Business Operations Director Daryal Gant, (left) Lab Director Dr. Edward Stone and Associate Director Kirk Dawson dedicate the Safety Operations Section's new facility. At right, senior industrial hygienist Julie Jackson shows Stone some of the instruments in the new laboratory.



Ed Fernandez, left, president of Sherikon Inc., and Willis Chapman, Division 64 manager, cut ribbon to dedicate newly remodeled JPL Archives facility. At right is Phil Knowlton, Sherikon director of strategic planning.

Sherikon Space Systems to manage Archives

JPL has awarded a contract for records management and archives services to Sherikon Space Systems Inc., of Cape Canaveral, Fla.

The contract, which became effective Sept. 21, requires Sherikon Space Systems to provide the personnel, facilities and equipment necessary to manage and operate the JPL Archives; provide records management support, including storage, retrieval and disposal services for noncurrent institutional records, as well as storage and retrieval services for the JPL Technical Library, Engineering Document Services, and Graphic Services; and fill secondary distribution requests for JPL documents and publications.

"This contract is an expansion of the previous contract for records storage and retrieval services, because it adds the archival and secondary distribution services not re-quired of the former contractor," according to the contract technical manager and JPL chief archivist Dr. Michael Hooks. "We intend to develop a strong partnership with Sherikon Space Systems to ensure that the needs of our JPL and NASA customers are met."

On Nov. 13, Sherikon Space Systems held a formal opening of their newly remodeled JPL Archives and Records Management Facility at 145 N. Altadena Drive in Pasadena (the former JPL Building 512). Willis Chapman, manager of the Logistics and Technical Information Division, and Ed Fernandez, Sherikon's president and chief executive officer, cut a ribbon commemorating the opening, and employees gave tours of the facility afterward.

For archival and records management services, Hooks said, JPL employees should contact Sherikon Space Systems at (626) 449-1593 or e-mail jplarchives@sherikon.com. □

ISO auditors report on certification pre-assessment

By MARK WHALEN

Following a week of auditing activities conducted as a pre-assessment of JPL's readiness for ISO 9001 certification, representatives of third-party registrar Det Norske Veritas (DNV) debriefed JPL personnel on their findings Nov. 20.

The three DNV auditors conducted numerous interviews with JPL employees during the week, part of the process to prepare the Laboratory for ISO certification next March. Additionally, they met with

JPL internal assessors on Thursday to share their personal experiences as auditors and answer questions from the internal assessors.

DNV left a rough draft of its findings with JPL's ISO management representative, Chief Engineer John Casani.

According to DNV lead auditor Tom Dadson, a full pre-assessment report would take approximately two to three weeks to complete.

"In summary," Dadson said, "all three auditors have agreed that the one major area the most impos-

ing for us was JPL's documentation system," calling it complex and frustrating to get into.

Dadson wondered whether some documented procedures were necessary and asked whether some of them could be combined. "Many are not documented yet and the difficulty is trying to get to what you're looking for," he said.

"Whatever you can do to standardize it and simplify it, do it.

"It's not something management does for you," Dadson added. "It's going to take the

efforts of all technicians, engineers and everybody else."

The auditor also noted that employees are not always aware of the fact that JPL has a corrective action procedure, where problems can be reported and elevated upwards for resolution.

He described a series of both major and minor findings that need to be corrected for JPL's certification. Those categorized as "major" findings were those that represented "lapses in the system—we

See ISO, page 7

News Briefs

JPL's Infrared Focal Plane Array Technology Group in Section 346 has been awarded NASA's Effective Partnerships Prize and a cash award of \$10,000 for its paper describing the Laboratory's research and development of quantum well infrared photodetectors (QWIPs).

The award was accepted by group supervisor **Dr. Sarath Gunapala** during a formal ceremony at the American Institute of Aeronautics and Astronautics' Defense & Civil Space Conference in Huntsville, Ala., on Oct. 29.

Supported by interagency funding, the group's work at JPL's Center for Space Microelectronics Technology has produced a series of highly sensitive infrared detector arrays for NASA commercial, medical and defense applications, including Earth observations systems, astronomy, weather monitoring, thermal mapping, missile tracking and night vision aids.

A joint honor of NASA's Office of Space Science and the AIAA, the prize was awarded following a peer review by practicing technologists and technology managers from NASA and other agencies of the U.S. government. Criteria for evaluating the papers in the NASA-wide competition included technical excellence of the contribution, short- and long-term benefits for Earth and Space Science at NASA, degree of synergism among the programs in the collaboration, and proposed utilization of the cash award, such as effective

partnering among agencies, education or public outreach. □

The winners of JPL's Notable Organizational Value-Added (NOVA) awards for October and November have been announced:

Section 313: Parag Vaze, John Wirth.

Section 387: Henry Conley, Timothy McCann.

Section 391: Frank Marfai, Tanisha Smith, Robert Warzynski.

Section 601: Neil Bautista, Eva Bazzarre, Jeffrey Behar, Pamela Brown, Mary Gilmore, Jeannine Harmon, John Houseman, Julie Jackson, Ruth LeBlanc.

Section 621: Martha Molodow-itch.

Section 622: Kathy Sovereign.

Section 660: Patricia Reed.

Section 661: Luba Berman, Robert Nofer, Hassan P Shankar, Carl Simon, Myrna Snitowsky.

Section 662: Rodolfo Devera, Robert Ewing, Douglas Hall, Carl Hallstrom, Sam Jacoby, Arturo Lemoncito, Armando Marquez, Nathaniel Ronquillo, Bruce Woodward.

Section 664: Ernest Breig, David Griffith, Alden Jenkins, Scott Susoeff. □

On Dec. 1, JPL will celebrate its 40th anniversary as a NASA installation. To note the day, and have some fun, the Public Affairs Office is planning to stage a parody of the TV show "Jeopardy," to be called "JPLardy," in von Kármán Auditorium from noon to 1 p.m.

For those who would like to be part of this event, help is needed in two separate and distinct areas:

- **Answers and their appropriate questions,** a la "Jeopardy," dealing with different categories of JPL history (e.g., spacecraft, planets, findings, personnel, facilities, events, etc.);

- **Contestants.** A round of nine questions will be held, with the top point-gatherer taking on two fresh contestants in another round, and so on for one hour.

Personnel can participate in the first or the second area, but not both. And if a lot of contestant-applicants sign up, a random drawing will be conducted for participants to play in one hour.

If interested, e-mail to Public Services Office Manager **Kim Lievens**. □

To have some fun and at the same time show off JPLers' creative abilities, Section 352 will on Dec. 18 host a balloon car contest in front of Building 180 from noon to 1 p.m.

Contest organizer **Paul MacNeal** said the competition is open to JPL employees, contractors and their immediate families. Those planning on having a family member attend the contest need to make arrangements with the Security Office in advance; call Myron Hitch at ext. 4-7610.

MacNeal defined a balloon car as any vehicle that travels on the course using one or two officially supplied balloons for power. A maximum of two balloons can be used on the car, but a total of four balloons will be provided to help with preliminary testing of the car. The officially provided balloons

are to be the only source of energy for the car.

Participants are not to work on their entry during working hours.

Balloons can be picked up in person and entries submitted at Building 301-325Q. MacNeal said the deadline for both is Dec. 15.

A grand prize trophy will be presented to the designer of the car that stays on the course and finishes the farthest distance from the starting point. In addition, certificates will be awarded for various categories.

For more information, call MacNeal at ext. 4-7824. □

Auditions for Caltech's production of Shakespeare's *Richard III* will be held Friday, Dec. 4 from 7 to 10 p.m. and Saturday and Sunday, Dec. 5 and 6 from 1:30 to 5:30 p.m. in the campus' Ramo Auditorium.

The show will be performed Feb. 12-28, 1999.

For more information, call **Craig Peterson** at ext. 3-2481 □

Voyager

Continued from page 3

billion miles) from Earth, or more than 56 times farther from the Sun than Earth is.

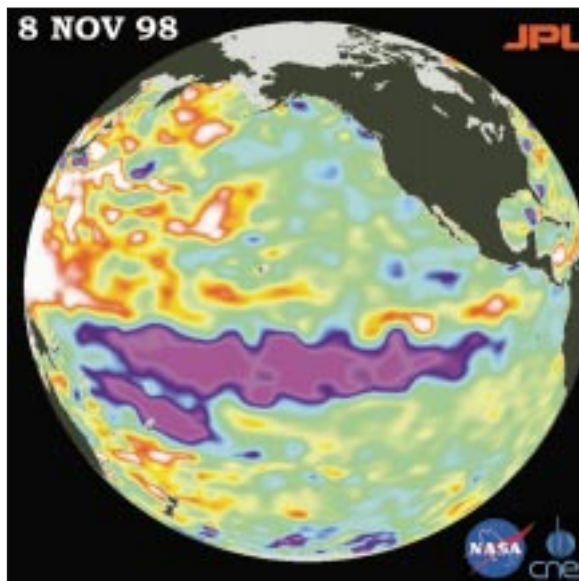
Its twin, Voyager 1, the most distant human-made object in space, is healthy and operating normally. Voyager 1 is leaving Earth's neighborhood at 35 degrees to the north of the ecliptic plane at a speed of about 17.3 kilometers per second (38,752 miles per hour). Voyager 1 is currently 10.8 billion kilometers (6.7 billion miles) from Earth. □

TOPEX

Continued from page 3

coexistence of these two contrasting conditions indicates that the ocean and the climate system have not recovered from the record-breaking warming that has occurred during the past two years.

A La Niña is essentially the opposite of an El Niño condition, but during a La Niña the trade winds are stronger than normal and the cold water that normally exists along the coast of South America extends to the central equatorial Pacific. Like El Niño, a La Niña situation also changes global weather patterns and is associated with the possibility of more winter storms entering North America in the Pacific Northwest and with less precipitation anticipated for Southern California and the southwestern United States. □♦



This image, taken by the U.S.-French TOPEX/Poseidon satellite on Nov. 8, shows that the low sea level, or cold pool of water commonly referred to as La Niña, the large purple mass in the center of the picture, has stayed about the same for the last five months, changing very little in size and heat content. The satellite's ability to monitor the entire ocean indicates there is also a large-scale warming taking place in the western Pacific, as indicated by the white areas surrounded by red in the upper left.

ISO

Continued from page 5

(JPL) haven't implemented it, or we've forgotten all about it." "Minor" findings were compared to parking tickets, which if allowed to accumulate might lead to more serious problems.

The findings were distributed over the 20 "elements" or major parts of the ISO standard. Major findings were identified in areas that were previously identified by internal assessments conducted by JPL's internal assessor teams. However, there were some new areas and greater detail of audit in all elements from the DNV auditors.

"I can't recommend you for certification until all Category 1 (major) issues are rectified," Dadson said.

Noting the upcoming end-of-the-year holidays, he said "it will

take a lot of focusing in the right direction between now and the end of March" for JPL to reach its goal of certification.

Casani told the gathering that the pre-assessment auditors "have done their job; now it's our turn. We're up to it."

ISO Implementation Team member Dr. Jerry Suitor noted that the team has already begun planning the next activities to make JPL compliant with the ISO standard. Improvements to the Develop and Maintain the Institutional Environment (DMIE) documentation system, additional documentation, documentation training, further internal assessments, and corrective action assignments to Executive Council members for resolution are some of the activities planned.

JPL employees can help the effort, Suitor added, by becoming familiar with the procedures they use in their daily work and knowing where in the DMIE documentation system they can find those procedures. □

Passings

Esther Baer, 75, a retired accounting clerk in the former Section 631, died of natural causes Oct. 30.

Baer worked at JPL from 1957-74. Services were held at Forest Lawn Memorial Park in the Hollywood Hills. □

William Payne, 73, a retired employee from Section 351, died of heart failure Nov. 3 at a Lancaster hospital.

Payne worked at JPL from 1978-89. He is survived by his wife, Yvonne; and children Madeline Clemann and Dale Payne.

Memorial services were held at Chapel of the Valley in Palmdale. Burial was at Arlington National Cemetery. □

For the record

Due to an editing error, an incorrect caption was placed under a photograph on page 1 of the Nov. 13 issue of *Universe*.

The caption should have described the photo showing the north polar cap of Mars surrounded by a zone of dark dunes, as imaged last summer by Mars Global Surveyor.

The image is available online at <http://photojournal.jpl.nasa.gov>. □

Next *Universe*: Dec. 18 Ad deadline: Dec. 2

JPLers' holiday giving



JPL volunteers sort and box donations from employees during the recently completed United Way food drive. In all, 39 boxes of food were collected and distributed to five local United Way agencies, which will help feed about 1,200 families with JPL donations.

FOR SALE

AIRLINE TICKET, R/T, anywhere American Airlines flies, includes free hotel stays and 1 day free rental car, \$450; ENTERTAINMENT CENTER, large 3-piece lighted glass, \$99; FRIDGE, huge, \$59; LAPTOP, new Pentium with \$1,600 12.1 active matrix screen/modem, \$899; PAINTINGS modern art, orig. up to \$1,000, sell \$50-\$100; SOFTWARE, Word 97 upgrade, \$19, Adobe Photodelux or Photostudio, \$15; FICUS, fake, huge, \$39; FLOOR LAMPS (3), tall, black, halogen, \$25. 366-6134. ANTIQUES: child's bent wood rocker, \$50; 2 carved side chairs, needlepoint seats, \$400/pair; 2 velvet upholstered arm chairs, \$400/pair; all exc. cond.; Little Green Machine carpet cleaner, used once, \$50. 626/449-8035. APPLIANCES: Sears Cold Spot refrigerator, white, \$100; GE portable dishwasher, \$150; Caloric Gas Stove, cream colored, \$200; all in very good condition. 626/296-0082. BASEBALL CARDS, '89 Upper Deck set of (1-700), \$150; '90 Upper Deck miscellaneous cards, no Ken Griffey Jr., over 800 cards, \$100/obo (includes some higher-priced cards); large collection of Frank Viola cards, including '70 Topps; miscellaneous cards, including some Mark McGwire, Harmon Killebrew. 790-2825, Terri. BED FRAME, king size, never used, \$15/obo. 626/568-8298. BEDDING, almost new twin, queen and king bedspreads and

comforters, \$15-30 each. 626/398-4960. BEDROOM SET, oak, large dresser, dressing table with mirror, headboard, end table, TV stand, vg cond., \$199 for all. 909/592-2279. BEDROOM SET, youth platform bed (twin), desk, hutch, bookcase headboard, tall armoire; oak; cost \$4,000, good quality, \$1,500. 626/447-6423. BUNK BED, black metal, will help move, \$150/obo. 626/285-7284. CARPETS, Persian, new, handmade, silk & wool mixed, unique designs. 626/577-0022. CLARINET, needs four pads replaced but in excellent condition, \$195/obo. 626/446-6456. COMPUTER, Packard Bell, 486 SX-25, w/Windows 3.1, extremely compact, no monitor, \$75. 626/398-4960. COMPUTER, Power Computing 120MHz 601 (like PowerMac 7100), 48MB RAM, 500MB HD, MacOS 7.5.5, incl. bundled software, \$500/obo. 626/568-9890, Alan, after 6 p.m. COMPUTER ACCESSORY, Microsoft Sidewinder 3D Pro joystick for Macintosh, vg condition, hardly used, \$50. 795-6530, eves. COMPUTER ACCESSORY, AdvanSys PCI UltraSCSI-3 adapter,

adds 1 external and 1 internal SCSI-3 narrow (50-pin) connectors to PCI PowerMac or PCI-equipped WinTel computer, provides 20MB/sec maximum data transfer rate, \$75. 795-6530, eves. DESK, wood, large L-shaped, \$120. 626/449-2795, 4-7 p.m. DIVE GEAR, wet suit (complete), plus regulator, fins, mask, all paraphernalia, exc. tanks, \$50. 626/398-4960. DRYER, Maytag, 240V, model HDE 308, 15 years, fully featured, 2 temps, 3 cycles, runs great, vg cond., \$80. 626/296-8633. EXERCISE MACHINE, NordicTrack Achiever, with Fitwatch, exc. cond., \$350. 805/255-5645. EXERCISE MACHINE, SoloFlex, great condition, \$300/obo. 626/447-6423. FIREWOOD, \$2.50/bundle. 248-0853. FLUTE & PICCOLO, Haynes, sterling silver, high quality, \$1,300 & \$900 (appraised higher). 727-7480, Len Lebow. GUITAR, vintage 1966 Fender Mustang electric, bright red finish, very good condition, \$550. 626/351-5485. FOOTBALL CARDS, various brand names, unopened boxes (24 packs), major stars and rookies, \$50; BASEBALL PACKS, unopened '87 Topps (48 cards/pack), possible McGwire rookie card; also Ryan, Rose, Schmidt, and Bo Jackson, Bonds, Bonilla, Will Clark and Palmiero rookie cards; \$10/pack or \$25 for 3 packs. 626/914-6083. GAZEBO, CalSpas, 16' x 12', redwood, enclosed, includes 1

Continued on page 8

table w/4 chairs, 1 bar table w/4 stools, 4 redwood planters, \$700. 626/444-6156, Bob or Annie.

KILIMS, Persian, two, gorgeous 26" x 36" hand-made, \$59 each; 58" x 84" hand-made, \$99. 626/446-6456.

LAMPS (4 units), night use, crystal ball shape, 2 are 1 ft. tall (7" dia.), 2 are 1.5 ft. tall (9" dia.), \$30 for small pair, \$50 for large pair, \$70 for all/obo. 909/592-0780, Ana.

LAWN MOWER, excellent condition, Murray brand, \$150; WEED TRIMMER, excellent condition, Makita, with spool, \$175/obo. 805/288-2235.

MONITOR, 21" Viewsonic P810, \$800; Matrox Millennium II with 8MB, \$150; Diamond Monster 3D, \$40. 213/264-8388, Patrick.

MOVING SALE, 8 a.m.-4 p.m. Fri.- Sat., Nov. 27-28, 17633 Horace St., Granada Hills, furniture, appliances, exercise equip., children's clothes and toys, lots of good stuff.

MOVING SALE, furniture and appliances, oak TV/stereo stand, Tappan microwave oven, 6 x 9 off-white rug, oak dinette with 2 built-in leaves and 4 matching chairs with cushions, white w/gold trim matching desk, dresser w/mirror and nightstand; best offers, must sell. 626/797-6453.

ORGAN, Technics SX-EX50M, electronic console, U&L k-boards ea 44 ks, pedal 13, 1-touch play, voice setting computer, technichord, tempo set, autoplays chords, lk nw, paid \$7,500, must sell, sacrifice for \$1,350. 626/446-6456.

PRINTERS, Epson FX-80 dot matrix, like new, \$39/obo; Epson LQ-510 dot matrix, like new, \$99/obo, must sell. 626/446-6456.

PUPPIES, Lab, registered, shots, claws removed, yellow & black, \$400, La Verne. 909/596-7553.

REFRIGERATOR, 18 cu. ft., \$100. 626/285-7316.

RUGS, Persian, pair of 44" x 62" all wool, \$445; a beauty 56" x 80" wool & silk, \$985; gorgeous silk miniatures by a famous artist, 32" x 45", suitable for hanging on wall, \$1,085, must sell. 626/446-6456.

SKI JUMPER, women's size 6, "Thinsulate" insulated, made by Mountain Goat, never worn, still has tags, retail price \$210, pale blue & white, very nice, \$65. 626/798-0329.

SOFA BED, \$40. 626/449-2795, after 4 p.m.

SPEAKERS, homebuilt giants featuring 15" woofers with 80 oz. magnets; complete with monster cable; \$200/obo. 790-6922.

SPORTS EQUIPMENT, WestBend Rower Model 5100, like new, reduced to \$49/obo; FiteOne Cross Country ski simulator, like new, reduced to \$49/obo, must sell. 626/446-6456.

STAMPS, collector's, USPS "Golden Moments" 1984 US Commemorative Olympics with hardbound book, also Olympic mailing envelopes and ticket stubs with cancellations from Olympic events and official Olympic souvenir program, \$30/obo. 626/798-0329.

STEREO, Aiwa AXR-005 receiver, 100W/channel surround receiver with remote, left channel doesn't work, project, \$10. 550-7555, Rob.

STEREO, old, Grundig, \$500; CASH REGISTER, antique, brass, \$500. 562/464-0446.

STEREO EQUIPMENT: Yamaha receiver, 100W/ch., built-in 5-band equalizer, remote, fantastic sound, exc. cond., \$119; Onkyo Dolby prologic surround sound decoder with center/rear

channel amps, remote, attach to any receiver to upgrade to Dolby prologic for home theater, \$99; Yamaha pre-amp, Dolby surround sound decoder, many a/v inputs, univ. remote, exc. cond, \$79. 909/592-2279.

STOOLS (2), like new, quality wood & fabric, hardly used, moving out sale, reduced to \$265 per pair/obo, must sell. 626/446-6456.

TABLE, dining room, round, mahogany, sits 8 with 2 extensions, almost new, comes with 6 matching chairs, \$700/obo; matching China buffet, \$1,000/obo; all for only \$1,500/obo. 909/592-0780, Ana.

TV STAND, oak, on coasters w/storage below and VCR shelf, can easily accommodate up to 27", \$50. 626/398-4960.

VACUUM CLEANER, Adjust Rite upright with full set of attachments, works well, \$15. 626/798-0329.

VIDEO GAME, Super-Nintendo set; system, 2 controllers, 7 games, exc. cond., \$99. 909/592-2279.

WATER JUG, Brita, 2-gallon unit with 4 unused filters, \$18/obo. 626/568-8298.

WINE RACK, wrought iron, holds 7 bottles of wine in a circle formation, stands approx. 2.5 ft. off the ground, very nice, \$20. 626/798-0329.

VEHICLES / ACCESSORIES

BMW bra, black, possibly for a 320i, \$15. 626/798-0329.

'86 CADILLAC Fleetwood, 4 door, white w/landau top, leather interior, wire spoke wheels w/premium tires, a/c, 142K miles, all maintenance records, \$3,225 firm. 626/355-8574.

'71 CHEVROLET Malibu, \$3,500/obo. 626/285-7316.

'84 DODGE D-50 pickup truck, vg cond., auto, 2.6 eng., tilt wheel, bedliner, shell, new battery, very clean, well maintained, 138K mi., orig. owner, \$2,600. 626/332-2682.

'95 FORD Windstar LX, loaded, with tow package, excellent condition, 60K, bra, mag wheels, carpet kit, front and back environment controls. 213/293-3354.

'96-'99 HONDA Civic custom black seat covers, 3 months old, dash board covers and floor mats; for front and back, whole set \$400. 993-0779, after 6 p.m.

'97 HONDA Accord EX coupe, metallic silver/tan, auto, 12k miles, loaded, Honda premium sound w/6-disc CD changer, power moonroof, windows/locks/seats/etc., like new, no accident, orig. owner, \$17,000/obo. 310/204-0825.

'94 HONDA Accord EX, 2-dr. coupe, blk/tan, v-tech eng., loaded, full pwr, well maintained, all original, \$10,600. 626/798-7261, Todd.

'91 HONDA Civic EX, power window, power steering, auto, 45,300 miles, records available, single owner, \$9,900/obo. 626/791-3194.

'87 HONDA Accord; 113 K; 2 doors; silver; regular maintenance; \$2,800. 626/304-1025, Alex.

'98 ISUZU Trooper, 3.5L V6, 4 x 4, air cond., CD, power windows, power door locks, auto, salvage title, 3,000 miles, like new, mint cond., \$23,000/obo. 909/599-3230.

'98 MERCEDES 300 SE, 93K miles, taupe, excellent condition, stock plus 6-CD changer, \$15,995. 891-6836, Steve.

'85 MERCEDES BENZ 190 E, \$5,000/obo. 805/553-9443.

'97 NISSAN Altima GXE, auto, 14,500 miles, air cond., power windows, power door locks, am/fm/stereo cassette, exc. cond., \$11,954/obo. 569-2032, pager, or 909/599-3230.

'67 PORSCHE 912, 2nd rebuild of engine; good interior; no engine problems, \$4,500/obo. 706-9552.

'94 SATURN SL2, 5 sp., 91K mi., am/fm, a/c, exc. cond., absolutely reliable, \$6,000. 790-6922.

'89 SEADOO SP, runs great, \$1,500. 626/798-4131.

'91 SUBARU Loyale wagon, 5 speed, 4WD, air, full power, white, ski rack, chains, stereo cass., 192K mi., \$2,900/obo. 909/599-2598.

'89 TOYOTA pickup truck, good condition, 97K miles, \$4,000. 949/766-0223.

'80 VOLVO 240DL, 4 spd., new tires, am/fm/cass., \$1,100. 952-9463.

'72 VW, 1835cc motor, \$850 firm. 562/464-0446.

WANTED

INSTRUMENTS needed for community music school; need piano, strings, winds, drums, etc.; all donations appreciated. 626/794-1792.

ROOM in house w/backyard, only can afford \$350/month including utilities, have 1 basset hound, outdoor dog, only inside the house whenever the owner is home. 626/287-1072, Rani.

ROOMMATE to share with 3 others; 3-bd. Pasadena apt., \$385 + deposit. 626/564-1078, Beth.

SPACE INFORMATION & memorabilia from U.S. & other countries, past & present. 790-8523, Marc Rayman.

VANPOOL RIDERS, #30, Santa Monica/West L.A.; read, talk, sleep, or daydream your commute away; part-time or full-time riders, 2 convenient pick-up spots. Ext. 3-1139, Duane Bindschadler.

VANPOOL RIDERS, #3, from Rancho Cucamonga/Upland/Claremont/LaVerne area to JPL. Ext. 4-8343, Mike Taylor or 4-5831, Rhea Clearwater.

VOLLEYBALL PLAYERS, coed, all levels of play, Tuesday nights 8-10 at Eagle Rock High School, \$4/night. 956-1744, Barbara.

FREE

CLEAN FILL DIRT [mostly gravel like], you haul, several cu yds., take as little or as much as you like, 3 blks. ESE of NY & Hill, Altadena. 791-3103.

LOST & FOUND

Lost: JPL WINDBREAKER, special shade of tan with a touch of green; Lost on Nov. 12 in 167 Cafeteria about 10 a.m. Suzanne, ext. 3-0537.

FOR RENT

ALTADENA house to share, overlooks East Lot, walk to JPL, wood floors, fireplace, dogs OK, female pref., avail. Dec. 1, \$500. 989-1930 or 626/798-6302, Michele.

ARCADIA, cozy, furnished room; includes kitchen privileges, washer, dryer, swimming pool; no smoking, \$350. 626/448-8809, Shary.

EAGLE ROCK hilltop house, gorgeous, 3 bd., 2 ba., all modern, easy access to JPL/Caltech, \$1,300. 213/254-5350.

LA CRESCENTA condo, 2 bd., 2 ba., washer/dryer, 10 min./JPL, great school, 2-car parking, \$980. 890-5655.

MONTROSE 2-story townhouse, 2 mi. to JPL, spacious 2 bd. + 2 1/2 ba., quiet gated community, cathed. ceiling, subterr. parking, fireplace, a/c, refrig., beautiful cond., great area, walk to shops and restaurants, \$1,400. 626/577-7922.

PASADENA, 2 bd., 1 ba., hardwood floors, new tile bath & kitchen floors, fireplace, separate living and dining rooms, h/ac, new stove, w/o hookups, large yard, patio, garage; no smokers; 1 block north of San Marino, Santa Anita Ave., \$1,500. 248-1433.

SIERRA MADRE apt., 2 bd., 1.5 ba., quiet 6-unit building, balcony, view, hot water included, \$790. 626/355-7318.

SOUTH PASADENA, furn. studio apt. on 1 level, 1718 Huntington Dr. betw. Milan/Marengo; laundry facilities on premises, parking space; non-smoker; no pets; \$565, utilities pd.; available 12/14. 626/792-9053, Marilyn.

REAL ESTATE

BIG BEAR, new cabin 2 blocks from lake, 2 bd., 2 ba., mud/laundry room, \$129,000. 909/585-9026.

PALM DESERT, exquisite, 2 bd., 2 ba. villa, for vacations or long term, newly remodeled, w/skylight, patio & 2-car garage; located across the Living Desert, great private, secure resort w/tennis cts., multiple pools & spas, clubhouse facilities; great locality, around 2 top resorts. 909/620-1364.

TEHACHAPI area, new custom house, 2,100 square feet, 3 bd., 2 ba., 2-car garage, 2,800 square-foot Dutch barn, panoramic mtn. views on 2.5 acres, \$155,000. 626/794-5858.

VACATION RENTALS

BIG BEAR, 7 mi. from slopes; full kitchen, f/p, 2 bd., 1 ba., sleeps 6; reasonable rates; 2-night minimum; no smokers, no pets; exc. hiking, biking, fishing nearby. 909/585-9026, Pat & Mary Ann Carroll.

BIG BEAR LAKE cabin, near lake, shops, village, forest trails, 2 bd., sleeps up to 6, fireplace, TV, VCR, phone, microwave, BBQ and more, JPL disc price from \$65/night. 909/599-5225.

BIG BEAR LAKEFRONT lux. townhome, indoor/outdoor spa, near skiing, beautiful stone fireplace, sleeps 6. 949/786-6548.

CAMBRIA, ocean front house, exc. view, sleeps up to 4, \$125/night for 2, \$175/night for 4. 248-8853.

HAWAII, Kona, on 166 feet of ocean front on Keauhou Bay, private house and guest house comfortably sleep 6; 3 bd., 2 ba., swimming, snorkeling, fishing, spectacular views, near restaurants, golf courses and other attractions. 626/584-9632.

HAWAII, Maui condo, NW coast, on beach w/ocean vw., 25 ft. fr. surf, 1 bd. w/loft, compl. furn., phone, color TV, VCR, microwave, dishwasher, pool, priv. lanai, slps. 4, 4/15-12/14 rate: \$95/night/2, 12/15-4/14 rate: \$110/night/2, \$10/night/add'l person. 949/348-8047.

MAMMOTH condo in Chamonix at lifts 7, 8, 16, 17; walk to Canyon Lodge, 2 bd., 2 full ba., sleeps 6, fully eqpd. elec. kitch., microw. & extras, fireplace/wood, color TV, VCR, FM stereo, o/d Jacc., sauna; game, rec. & laundry rms., conv. to shops, walk to lifts; spec. midweek rates. 249-8524.

MAMMOTH condo, 2 bd. + loft, 3 ba., slps. 8, spa, full kitchen, TV/VCR, covered parking; walk to Canyon Lodge; JPL discount. 249-8088.

MAMMOTH condo, studio + loft, 2 ba., fireplace w/wood supplied, Jacuzzi, sauna, game rm., color cbl. TV/VCR, full kitchen w/microwave, terrace, view, amen. 714/870-1872.

OCEANSIDE, on the sand, charming 1 bd. condo, panoramic view, walk to pier or harbor, pool, spa, game rm., sleeps 4. 949/786-6548.

PACIFIC GROVE house, 3 bd., 2 ba., fp, cable tv/vcr, stereo/CD, well-eqpd. kitchen w/microw. beaut. furn. close to golf, beaches, 17 Mile Drive, Aquarium, Cannery Row, JPL discnt. 626/441-3265.

PALM DESERT, exquisite, 2 bd., 2 ba. villa, for vacations or long term, newly remodeled, w/skylight, patio & 2-car garage; located across the Living Desert, great private, secure resort w/tennis cts., multiple pools & spas, clubhouse facilities; great locality, around 2 top resorts. 909/620-1364.

PALM SPRINGS condo, 1 bd., compl. furn., pool, spa, tennis, cable TV, VCR; carpets, paint, cooking utensils new; rent daily, weekly, weekends, monthly. 626/445-0884.

S. LAKE TAHOE Keys waterfront home, 4 bd., 3 ba., sleeps 12+, fireplace on 2 levels, decks overlook priv. dock/ski lifts, gourm. kitch., bikes, sail and paddle boats, 3 color TVs, VCR, stereo w/tape/disk, in/outdoor pools, hot tub and beach; tennis, 10 min./skiing, casinos/golf, 1 hr./wine country; \$995/wk. high season [15 June to 15 Sept; 22 Nov. to 1 March]; \$495/wk. low seas., + \$90 cleaning fee; 3-day min. 626/578-1503, Jim Douglas.

NOTICE TO ADVERTISERS

All housing and vehicle advertisements require that the qualifying person(s) placing the ad be listed as an owner on the ownership documents.

Universe

Editor

Mark Whalen

Photos

JPL Photo Lab

Universe is published every other Friday by the Public Affairs Office of the Jet Propulsion Laboratory, California Institute of Technology, 4800 Oak Grove Drive, Pasadena, CA 91109.

Advertising is a free service offered only to JPL, Caltech and contractor employees, retirees and immediate families.

Ads must be submitted on ad cards, available at the ERC and the Universe office, Bldg. 186-118, or via e-mail to universe@jpl.nasa.gov. E-mail ads are limited to six lines.

Ads are due at 2 p.m. on the Monday after publication for the following issue.

To change an address, contact your section's administrative assistant, who can make the change through the HRS database. For JPL retirees and others, call Xerox Business Services at (626) 844-4102.

